

DISCUSSION OF THE AMENDMENT

Claims 19, 24 and 29 have been amended by incorporating the subject matter of Claim 22 therein, together with a crosslinking technique, as supported in the specification at page 11, lines 20-23, and by changing "of" to --comprising--. Claim 22 has been canceled.

No new matter is believed to have been added by the above amendment. Claims 19-21 and 23-30 are now pending in the application.

### REMARKS

Due to the length of the specification herein, Applicants will cite to the paragraph number of the published patent application (PG Pub) of the present application, i.e., US 2004/0089388, when discussing the application description, rather than to page and line of the specification as filed.

The rejections under 35 U.S.C. § 103(a) of:

Claims 19-26, 28 and 29 as unpatentable over U.S. 5,292,590 (Lin et al), taken in view of JP 63-8448 (JP '448), and

Claim 30 over Lin et al, taken in view of JP '448, and further in view of at least one of U.S. 5,280,817 (Liu et al) and U.S. 5,879,488 (Weston et al),  
are all respectfully traversed.

Lin et al discloses an innerliner formed from ethylene-vinyl alcohol polymer (EVOH), but does not disclose a modified EVOH, let alone a modified EVOH obtained by reacting a monofunctional epoxy compound therewith, followed by crosslinking by irradiation with an energy ray.

JP '448 discloses a resin composition comprising a vinyl alcohol resin and a compound having a functional group (such as an epoxy group) capable of being added to a hydroxyl group in the resin and having an allyl group, the compound being incorporated in the vinyl alcohol resin. The purpose of using such epoxy compounds is to improve water resistance by crosslinking of allyl groups, as stated:

When the thus-prepared monolayer or laminated molded article is cured in the air, allyl ether groups in the resin are further crosslinked internally. Therefore, the intended purpose, namely the improvement in water resistance, can be attained. (Page 15 line 24 to page 16 line 3 in the English translation.)”

There is no description about improving the flexing resistance or use in a pneumatic tire. Nevertheless, the Examiner holds it would have been obvious to modify the EVOH-

based innerliner of Lin et al with an epoxy group in view of JP '448 in order to improve water resistance.

As previously argued, and now maintained, JP '448 provides no motivation to modify the EVOH of Lin et al. No *prima facie* case of obviousness has been made out. Nor do Liu et al and Weston et al remedy any of the deficiencies in the combination of the remaining prior art.

In response to Applicants' reliance on the comparative data in the specification herein, which shows superiority of the present invention compared to the unmodified EVOH of the prior art, the Examiner finds that it is not commensurate in scope with the claims because only two epoxy compounds were exemplified, while the claims are not so limited.

In reply, and as explained in the specification herein at [0029], the object of modification by epoxy compounds is to greatly reduce the elastic modulus of the EVOH, which is caused by reduction of crystallinity. The rupture property and the degree of generation of cracks at a time or flexing is thereby improved. The above is not a function of **particular** epoxy compounds so long as the epoxy compound acts to reduce the regularity of the polymer chain. Any epoxy compound is applicable so long as it has an epoxy group which can react with a hydroxy group in the EVOH.

Regarding the Examiner's findings that the comparative data is limited to crosslinked copolymers, the present claims are now so limited. As described in the specification at [0041]:

In the innerliner of the present invention, it is preferable that the modified ethylene-vinyl alcohol copolymer (C) in the layer of the copolymer be crosslinked. If the modified ethylene-vinyl alcohol copolymer (C) is not crosslinked, a layer of the modified ethylene-vinyl alcohol copolymer (C) may deform seriously in a vulcanization process for producing a pneumatic tire to be unable to keep the layer uniform. As a result, the gas barrier property, flexing resistance and fatigue resistance of an innerliner may be worsened.

The modified EVOH (C) of the present claims has a low melting point and low elastic modulus, yet it is very important to keep the layer of the modified EVOH (C) uniform during the vulcanization process. Therefore, it is necessary to introduce crosslinking by irradiation with an energy ray before the vulcanization process. It is surprising that a layer having a relatively low melting point endures the relatively high vulcanization temperature, while maintaining excellent gas barrier property and flexing resistance.

It is worth repeating that the problem of using unmodified EVOH for the innerliner, which the present invention addresses, as described in the specification at [0006], is:

Use of a normal EVOH as an innerliner results in a great effect of improving the internal pressure retainability. However, the normal EVOH has an elastic modulus extremely higher than those of rubbers usually used for tires. Therefore, a rupture or crack may be generated in the innerliner due to its deformation caused by its flexure. For such reasons, when an innerliner made of EVOH is used, although the internal pressure retainability of a tire before use is greatly improved, the internal pressure retainability of a tire after use, which was applied with flexural deformation during the rotation of the tire, may be worsened than that before use.

As described in the specification at [0008]-[0009]:

An object of the present invention is to provide an innerliner for pneumatic tires which is superior in gas barrier property and flexing resistance. Another object of the present invention is to provide a pneumatic tire having greatly improved internal pressure retainabilities before and after driving through an improvement of the internal pressure retaining technology such as an innerliner.

Therefore, in the present invention, the object of modification with epoxy compounds is to obtain improved flexing resistance. The advantages of employing monofunctional epoxy compounds are described in the specification at [0037]:

The epoxy compound (B) for use in the present invention is not particularly restricted, but it preferably is a monofunctional epoxy compound. If the epoxy compound (B) is an epoxy compound with two or more functionalities, a crosslinking reaction with the ethylene-vinyl alcohol copolymer (A) may

occur to deteriorate the quality of the innerliner for pneumatic tires due to generation of gels, pimples and the like.

There is no reason to believe that water resistance is a problem in Lin et al for which one skilled in the art would consult JP '448 to solve.

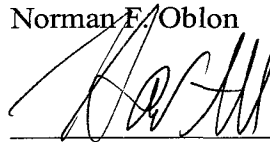
For all the above reasons, it is respectfully requested that these rejections be withdrawn.

Applicants respectfully call the Examiner's attention to the Information Disclosure Statement (IDS) **submitted herewith**. The Examiner is respectfully requested to initial the Form PTO 1449 submitted therewith, and include a copy thereof with the next Office communication.

All of the presently-pending and active claims in this application are now believed to be in immediate condition for allowance. The Examiner is respectfully requested to now examine the nonelected species, and in the absence of further grounds of rejection, pass this application to issue with all pending claims.

Respectfully submitted,

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